REMARKS

Claims 1, 10 and 20 have been amended to place the above-referenced application in condition for allowance. In view of these amendments and the following reasoning for allowance, the applicants hereby respectfully request further examination and reconsideration of the subject application.

The Section 103(a) Rejection of Claims 1, 5, 10, 15, 20 and 25

In the Final Office Action dated August 13, 2003 (Paper No. 10) issued in the subject application, Claims 1, 5, 10, 15, 20 and 25 were rejected under 35 USC 103(a) as being unpatentable over Arbuckle, U.S. Patent No. 5,842,194 in view of Niyogi et al., U.S. Patent No. 6,345,110 (hereinafter Niyogi). It is contended in the Office Action that Arbuckle teaches all the elements of the rejected claims with the exception of creating a database that includes a person's face pose. However, it is further contended that the Niyogi reference does teach this feature. Thus, it was concluded that it would have been obvious to incorporate the Niyogi teachings into Arbuckle to produce the applicants' claimed invention. In response, the applicants have amended the rejected claims to make them non-obvious over the Arbuckle-Niyogi combination.

More particularly, the independent claims in the rejected group (i.e., Claims 1, 10 and 20) were each amended to indicate the fusing neural network combines the outputs of the classifiers to generate an output indicative of the person associated with the characterized input image region **and the face pose of that person**, and that the network ensemble is employed to identify the person associated with the characterized input image region **and the face pose of that person**. This combined output of both the identity of the person and their face pose is not taught in Arbuckle or Niyogi, and so is not taught in the combination thereof.

Arbuckle teaches a scheme where images of a person captured at different resolutions are used to train a neural network ensemble to identify that person. Thus, in general it does not matter what resolution an image of a person exhibits, the Arbuckle invention allows that image to be input to the ensemble and if the person is known to the system, produce the identity of that person. However, of particular importance to the present rejection is that Arbuckle does not both identify the person and indicate the resolution of the input image of that person. This is key because, the Niyogi reference teaches a scheme whereby the face pose of a person is identified after training a system with images of various people captured at a variety of face poses. The Niyogi invention does not identify the person in an input image; rather it just identifies their face pose. If the Arbuckle scheme was modified to train the ensemble with images of people at various different face poses, rather than resolutions, the result would still be the same. The person would be identified. However, in the modified scheme the identification is made regardless of the face pose of the image input. There is simply no provision in the Arbuckle or Niyogi teachings that would even suggest that not only the identity of a person be output, but their face pose as well. This is shown in Arbuckle by the following excerpt from Col. 15, lines 23-46:

> "The sets of numbers are now combined using fuzzy integration of Sugeno or Choquet or some other type with respect to a fuzzy measure as will be subsequently described. For example, in the case where there are five sets of distances corresponding to five resolutions, **there will be one number in each set which corresponds to each of the known faces**. Thus, if there are, say, sixty known faces, there will be sixty numbers in each set. Each of these numbers will lie in the range zero to one and the size of the number varies as the similarity of the unknown image to the known face which gave rise to that number. **For each known face in turn, the numbers corresponding to that known face are combined using fuzzy integration to reduce the five sets to one set of combined numbers** in which, again,

the larger a number is, the more the unknown face resembles the known face that gave rise to the number. **In other words, if there are five resolutions, the numbers for each face are combined to produce a new number. Thus, the total number of classifying numbers would be reduced by five in the case of five resolutions**. This will subsequently be described in more detail.

Having a single set of numbers, **one number for each of the known faces,** the actual recognition or rejection stages are now performed on this sequence of numbers. " (*emphasis added*)

As can be seen from the foregoing excerpt of Arbuckle, regardless of whether the sets of numbers represent faces at different resolutions or if as proposed by the Examiner they represent faces having different poses, the net result is that the Arbuckle invention combines these sets to produce a single set where a single number represents each known person at all resolutions (or poses as proposed). Thus, it would be impossible, even if the face pose database taught in Niyogi where substituted for the resolution database of Arbuckle, to produce both an indication of identity and the face pose of the identified person. This is because the Arbuckle scheme would always combine the resolution (or pose) data for each known person. As such no differentiation could be made once a person is identified what the resolution (or face pose) was in the input image.

In order to deem the applicant's claimed invention unpatentable under 35 USC 103, a prima facie showing of obviousness must be made. To make a prima facie showing of obviousness, all of the claimed elements of an applicant's invention must be considered, especially when they are missing from the prior art. If a claimed element is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie case of obviousness exists. The Federal Circuit court has stated that it was error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was

not taught therein (*In Re Fine*, 837 F.2d 107, 5 USPQ2d 1596 (Fed. Cir. 1988)).

In this case, the cited combination does not teach both identifying a person from an input image while at the same time identifying their face pose. Nor does the cited combination recognize the advantages of doing so-namely knowing not only who is in an image but also where they may be looking. Thus, the applicant has claimed an element not taught in the cited combination, and which have advantages not recognized therein. Accordingly, no prima facie case of obviousness can be established in accordance with the holding of *In Re Fine*. This lack of prima facie showing of obviousness means that the rejected claims are patentable under 35 USC 103 over Arbuckle in view of Niyogi. As such, it is respectfully requested that the rejection of remaining Claims 1, 5, 10, 15, 20 and 25 be reconsidered based on the non-obvious claim language,

> "training a neural network ensemble to identify a person and their face pose...a fusing neural network as its second stage which combines the outputs of the classifiers to generate an output indicative of the person associated with the characterized input image region **and the face pose of that person**; and employing the network ensemble to identify the person associated with the characterized input image region **and the face pose of that person**".

The Section 103(a) Rejection of Claims 6, 9, 16, 19, 26, 29 and 31

Claims 6, 9, 16, 19, 26, 29 and 31 were rejected under 35 USC 103(a) as being unpatentable over Arbuckle in view of Niyogi, and in further view of Turk et al., U.S. Patent No. 5,164,992 (hereinafter Turk). It is contended in the Office Action that the Arbuckle-Niyogi combination teaches all the elements of the rejected claims with the exception of the details of using PCA. However, it is further contended that the Turk reference teaches this feature. Thus, it was concluded that it would have been obvious to incorporate the Turk teachings into Arbuckle-Niyogi combination to

produce the applicants' claimed invention. In response, the applicants have amended the rejected claims to make them non-obvious over the Arbuckle-Niyogi-Turk combination.

As shown previously, Arbuckle teaches a scheme where images of a person captured at different resolutions are used to train a neural network ensemble to identify that person, and Niyogi teaches a scheme where a person's face pose can be determined from their image but not that person's identity. Further, incorporating the teachings of the Niyogi face pose database into the Arbuckle invention does nothing but allow a person to be identified regardless of their face pose. It does not allow for the identification of the person and providing the face pose at the same time. As shown previously there is no provision for this in the cited references. Only the applicants have realized the advantages of providing both the identity and face pose of a person from an image of the person- namely knowing not only who is in the image but also where they may be looking. Thus, the applicant has claimed an element not taught in the cited combination, and which have advantages not recognized therein. The addition of the PCA teachings of Turk does nothing to change the fact that the cited combination is missing the now claimed feature of producing both a person's identity and their face pose.

Accordingly, the applicants have claimed a feature not taught in the cited combination of references, and which have advantages not recognized therein. As such, no prima facie case of obviousness has been established in accordance with the holding of *In Re Fine*. This lack of prima facie showing of obviousness means that the rejected claims are patentable under 35 USC 103 over Arbuckle in view of Niyogi, and in further view of Turk. It is, therefore, respectfully requested that the rejection of Claims 6, 9, 16, 19, 26, 29 and 31 be reconsidered based on the previously quoted non-obvious claim language.

<u>The Objections to Claims 7, 8, 17, 18, 27, 28 and 32-34</u>

Claims 7, 8, 17, 18, 27, 28 and 32-34 were objected to as being dependent upon a rejected base claim. The Examiner stated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The applicants at this time, however, respectfully decline to rewrite these claims because it is their position that the independent claims from which these claims depend are patentable.

The Niyogi Reference, U.S. Patent No. 6,345,110

It is noted that the Niyogi reference cited by the Examiner in the Final Office Action does not appear to have been officially entered as a Cited Reference. The applicants respectfully request that the Examiner do so.

Summary

In summary, it is believed that the pending claims are now in condition for allowance. Accordingly, reconsideration of the rejection of Claims 1, 5, 6, 9, 10, 15, 16, 19-20, 25, 26, 29 and 31 and withdrawal of the objections to Claims 7, 8, 17, 18, 27, 28 and 32-34, are respectfully requested. In addition, allowance of these claims at an early date is courteously solicited.

Respectfully submitted,

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